Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993)	)	WT Docket No. 09-66
	)	
14th Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services	)	

REPLY COMMENTS OF DR. TIMOTHY J. TARDIFF AND PROFESSOR DENNIS L. WEISMAN

Date: July 13, 2009

In its Public Notice in WT Docket No. 09-66, the Wireless Telecommunications Bureau sought comment on a number of issues related to the competitiveness of Commercial Mobile Radio Services.[1] In particular, the Bureau sought comment on whether various profitability measures, including the Lerner index,[2] can provide evidence of effective competition.[3] Certain parties, e.g., the Consumer Federation of America, et al. enthusiastically endorsed profitability metrics, in general, and explicit comparisons of costs and marginal costs—the essence of the traditional Lerner index—in particular.[4]

We strongly disagree with the consumer groups' endorsement of profit metrics and their assertion that such metrics will credibly demonstrate that effective competition for wireless services is lacking. As AT&T's comments discuss in detail, most of the metrics for which the Bureau has sought comments are based on *accounting*, rather than *economic* measures of costs and profits.[5] Accordingly, they provide no meaningful information as to whether wireless firms are earning supranormal *economic* profits on a non-transitory basis (which would be the only valid measure of the existence of market power).[6]

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[1] Public Notice, Wireless Telecommunications Bureau Seeks Comments on Commercial Mobile Radio Services Market Competition, DA 09-1070, WT Docket No. 09-66 (released May 14, 2009) ("*Notice*").

[2] The Lerner index is the ratio of the difference between price and marginal cost to price. Therefore, it can range from zero (when price equals marginal cost) to 1.0 (when marginal cost is zero).

[3] *Notice* at 12.

[4] Comments of Consumer Federation of America, Consumers Union, Free Press, Media Access Project, New America Foundation, and Public Knowledge, Before the Federal Communications Commission, In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Conditions With Respect to Commercial Mobile Services, WT Docket No. 09-66, June 15, 2009 at 19-20.

[5] Comments of AT&T Inc., Before the Federal Communications Commission, In the Matter of Wireless Competition Bureau Seeks Comments On Commercial Mobile Radio Services Market Competition, WT Docket No. 09-66, June 15, 2009 at 50-58.

[6] We note that the presence of market power in and of itself is not sufficient to warrant regulation—especially in technologically dynamic industries such as telecommunications. Rather, regulation can be justified only if its potential benefits (e.g., putatively lower prices) clearly outweigh the costs imposed by regulation—particularly in inhibiting technological and service innovations. See, for example, Glen O. Robinson and Dennis L. Weisman, "Designing Competition Policy for Telecommunications." *The Review of Network Economics*, Vol. 7(4), December 2008, pp. 509-546 (available at http://www.rnejournal.com/artman2/publish/vol7/index.shtml); and Dennis L. Weisman, *Principles of Regulation and Competition Policy for the Telecommunications Industry - a Guide for Policymakers*. The Center for Applied Economics, KU School of Business, Technical Report 06-0525, 2006 (available at http://www.business.ku.edu/_FileLibrary/PageFile/155/TelecomWeisman.pdf .)

While the Lerner Index has been well-known in economics as a possible measure of market power, it can result in erroneous inferences in industries with characteristics that typify telecommunications: (1) cost structures with large fixed and/or sunk costs and low marginal costs and (2) firms offering multiple products, many of which are complements; and (3) rapid rates of technological advance. The scale and scope economies induced by these signature characteristics generally result in Lerner indices with high price-cost margins, not because firms are earning abnormally high economic profits, but because they must recover their fixed costs and account for demand and supply relations among their several products in the process of earning normal profits. In other words, naïve calculation of Lerner indices, without proper adjustment for scale and scope economies can lead to badly misleading inferences of market power, when in fact robust competition is present.[7] We have explored this issue in detail in our forthcoming article—a copy of which is included as Attachment A.[8]

Not only can mechanical calculation of Lerner indices be highly misleading, but the Commission is already using and properly interpreting a measure that provides very similar information. In particular, the Herfindahl-Hirschman indices (HHI)[9] that the Annual Reports have used to assess wireless market concentration can be interpreted as a share-weighted average of the Lerner indices for the firms operating in specific markets.[10] And based on HHIs that would be considered "highly concentrated" for some industries[11] (and other performance measures), the FCC has nonetheless concluded for many years that there is effective wireless competition.[12] Moreover, in interpreting the HHI's for the wireless market, the FCC has likewise recognized the limitations of this metric.

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[7] The adjustments required to produce meaningful Lerner indices tend to be very data intensive. In particular, information on own and cross elasticities and marginal cost and price information for multiple products or services are needed.

[8] Tardiff, T.J. and Weisman, D.L., "The Dominant Firm Revisited," *Journal of Competition Law & Economics*, Vol. 5, No. 3, September 2009, forthcoming.

[9] The HHI equals the sum of the squared market shares, multiplied by 10,000. Thus, the index ranges from essentially zero—infinite number of small firms to 10,000—a monopoly.

[10] In particular, with Cournot competition, the HHI divided by the market demand elasticity equals the market-share weighed average of the individual firms' Lerner indices.

[11] U.S. Department of Justice and the Federal Trade Commission, *Horizontal Merger Guidelines*, 1992 at § 1.51.

[12] See, for example, Thirteenth Report, Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Conditions With Respect to Commercial Mobile Services, WT Docket No. 08-27 at ¶ 1 (January 16, 2009).

> In interpreting these HHIs, it is important to note that the number of competitors a market can support depends on two key factors: (1) the size of the market and (2) the minimum efficient scale (MES) of production, which is defined as the level of output at which economies of scale are fully exploited. In industries where economies of scale are significant and MES is large relative to the demand for the relevant product or service, the market has room for only a small number of firms operating at the lowest possible cost.[13]

Finally, even if a carefully crafted analysis of the wireless market revealed that competition was imperfect, this does not suggest that regulation is warranted. The proper comparison for the purposes of competition policy is that of imperfect competition with imperfect (perhaps even highly imperfect) regulation. Given the continued competitiveness of the wireless industry under deregulation in the U.S.—as repeatedly documented in the annual CMRS competition reports—and the high cost borne by the U.S. economy in delaying the launch of wireless in this country,[14] policy makers should continue to defer to the market rather than attempt to regulate this technologically dynamic industry.

Respectfully submitted,

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[13] *Ibid*. at ¶ 47.

[14] For example, Professor Jerry Hausman estimated the economic cost of regulatory delay in implementing cellular telephone service was estimated at more than $25 billion. Jerry Hausman "Valuing the Effect of Regulation on New Services in Telecommunications," *Brookings Papers on Economic Activity: Microeconomics*, Brookings Institution, 1997, pp. 1–38.

Attachment A

Timothy J. Tardiff and Dennis L. Weisman, D.L., "The Dominant Firm Revisited," *Journal of Competition Law & Economics*, Vol. 5, No. 3, September 2009, forthcoming.

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THE DOMINANT FIRM REVISITED

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ABSTRACT

This paper presents a framework for evaluating whether a firm lacks dominance in a particular market despite manifesting relatively high market shares. We show that demand complementarities and high price–cost margins combine with multi-market participation to reduce the significance of market share in drawing inferences about dominance. We further show the equivalence between this multi-market measure of market power and the critical elasticity for the dominant firm. These findings suggest that the use of traditional (single-market) measures of market power commonly used to infer dominance can lead policymakers to maintain regulatory oversight when market forces are sufficient to provide the requisite degree of "competitive" discipline.

JEL: K21; L43; L51; L96

I. INTRODUCTION

In recent years, there has been a major shift in public policy with respect to the nature of and prospects for competition in the telecommunications industry, especially in North America. Up until the beginning of 2004,[1] a prevailing view was that a major source of competition for formerly regulated monopoly incumbents would take the form of entrants providing retail services provisioned with wholesale elements obtained from the incumbents on a mandatory basis. Subsequently, this type of competition has ebbed in importance—attributable in part to (i) the availability of wholesale inputs being scaled back; (ii) competitors that formerly availed themselves of wholesale inputs having been acquired by incumbents (SBC acquiring AT&T to become the new AT&T and Verizon acquiring MCI); and (iii) "intermodal" alternatives such as cable telephony, wireless, and voice over Internet protocol (VoIP) expanding markedly in volume. These developments notwithstanding, the incumbents' market shares for traditional local

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[1] Tardiff describes specific events associated with these developments. Timothy J. Tardiff, *Changes in Industry Structure and Technological Convergence: Implications for Competition Policy and Regulation in Telecommunications*, 4 INT'L ECON. & ECON. POL'Y 109–133 (2007).

voice services have remained high by conventional standards. And yet, these dominant providers have contended that their retail prices should be deregulated (or at least be subject to relaxed regulation), and an increasing number of regulators have concurred with this assessment.

The term dominant provider typically refers to a firm operating in a well-defined product or geographic market with a high market share and barriers to entry that confer significant market power.[2,3] According to Areeda and Hovenkamp,

> Thus, the substantial market power that concerns antitrust law arises when the defendant (1) can profitably set prices well above its costs and (2) enjoys some protection against a rival's entry or expansion that would erode such supracompetitive prices and profits.[4]

Hence, for the purposes of this analysis, we treat market dominance and substantial market power (significant market power or SMP as it is commonly referred to in Europe) as being synonymous.

In a regulated context, dominance is generally considered necessary and sufficient for subjecting a market provider to economic regulation.[5] That is to say, in markets that are subject to economic regulation, a firm should be regulated if and only if that firm is dominant in that particular market. Although the literature recognizes that economic regulation should serve as a surrogate for competition,[6] it does not provide policymakers with unambiguous guidance as to when deregulation is warranted. As Professor David Sappington has observed

> It is generally preferable to replace regulatory control with the discipline of competition when competition provides adequate protection for consumers. In practice, though, it is often difficult to determine precisely when adequate, sustainable competitive pressures have developed.[7]

[2] Massimo observes that "dominance relates to a situation where a firm enjoys a very high degree of market power, but the jurisprudence has made it clear that a firm with 40 percent of the relevant market—far from being a monopolist—might well be a dominant one." MASSIMO MOTTA, COMPETITION POLICY THEORY AND PRACTICE 34–35 (Cambridge, UK: Cambridge University Press, 2004).

[3] A firm possesses market power when it has "the ability profitably to maintain prices above competitive levels for a significant period of time." U.S. Department of Justice and the Federal Trade Commission, *Horizontal Merger Guidelines* § 0.1 (1992).

[4] PHILIP E. AREEDA & HERBERT HOVENKAMP, FUNDAMENTALS OF ANTITRUST LAW 5–6 (3rd edn, New York: Aspen Publishers, 2005).

[5] For a critical account of the FCC's asymmetric regulatory policies in the long-distance market despite evidence that AT&T's was no longer dominant, *see* John Haring & Kathy Levitz, *What Makes the Dominant Firm Dominant?* (Federal Communications Commission Office of Plans and Policy, Working Paper No. 25, 1989).

[6] ALFRED E. KAHN, 1 THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS 17 (New York: John Wiley and Sons, 1970).

[7] David E.M. Sappington, *Price Regulation*, *in* HANDBOOK OF TELECOMMUNICATIONS ECONOMICS 265 note 58 (M. Cave, S. Majumdar & I. Vogelsang eds, Amsterdam: North-Holland, 2002).

Of the three components that typically comprise market dominance—high market share, barriers to entry, and significant market power—market share is perhaps the easiest to measure and hence the metric that regulators tend to focus on in drawing inferences about market dominance.[8] Whereas the shortcomings associated with using market share to infer market power are well known, particularly in regulated industries,[9] these tend not to have dissuaded regulators from relying upon such measures.

Regulators in the telecommunications industry are currently deciding upon the proper scope of regulatory oversight in the presence of competitive alternatives to traditional wireline telephone service. Whereas these competitive alternatives, including wireless and VoIP, have made sizable inroads, the market shares of the incumbent providers remain high by traditional standards,[10] and regulators may be reluctant to "let go" if there is a risk that prices will rise.[11]

In this paper, we contend that the inherent problems associated with traditional market share measures to infer dominance are exacerbated in the telecommunications industry as a result of a combination of market and technological factors, including scale and scope economies and demand complementarities.[12] As a result, undue reliance on traditional, single-market metrics to draw inferences about market power and dominance is likely to lead policymakers to maintain regulatory oversight when market forces are capable of providing the requisite degree of "competitive" discipline.[13]

[8] For a discussion of regulators' incentives and their focus on short-run market performance, *see* Glen O. Robinson & Dennis L. Weisman, *Designing Competition Policy for Telecommunications*, 7 REV. NETWORK ECON. 509 (2008).

[9] Landes & Posner observe that "To the extent that regulation is effective, its effect is to sever market power from market share. . . ." William W. Landes & Richard A. Posner, *Market Power in Antitrust Cases*, 94 HARV. L. REV. 937, 975 (1981).

[10] For example, as of the end of 2007, incumbent providers served about 82 percent of end-user switched telephone lines in the U.S. and about 81 percent of the lines in Canada. Federal Communications Commission, Industry Analysis and Technology Division, *Local Telephone Competition: Status as of June 30, 2007* (2008); Canadian Radio-television and Telecommunications Commission, *Communications Monitoring Report 2008* (2008). The U.S. incumbent share reported by the FCC may be somewhat overstated because the FCC's data appear to undercount the number of lines provided by cable television companies. In particular, the FCC reports 8.4 million lines using coaxial cable as of June 30, 2007, whereas the corresponding figure reported by the National Cable & Telecommunications Association (NCTA) is 15.1 million (NCTA statistics available at http://www.ncta.com/Statistic/Statistic/ResidentialTelephonyCustomers.aspx). Increasing the competitors' line count by the 6.7 million difference lowers the incumbent share to 79 percent.

[11] On the other hand, consistent with the analyses that we present here, a growing number of regulators have substantially reduced or eliminated price regulation, despite relatively high incumbent market shares. *See*, *e.g.*, Tardiff, *supra* note 1.

[12] For example, local and long-distance telecommunications, vertical features (call waiting, caller ID, call forwarding), broadband, and video may all be provided over common facilities.

[13] Evans and Noel argue similarly that the use of single-market metrics to analyze multi-sided business platforms introduces a bias into the merger-review calculus. David S. Evans & Michael D. Noel, *The Analysis of Mergers That Involve Multisided Platform Businesses*, 4(3) J. COMPETITION L. & ECON. 663 (2008).

The primary findings of this paper are four-fold. First, drawing inferences about dominance and market power in a particular market must be informed by that provider's multi-market participation. Second, the Lerner index for the particular market in question, a common measure of market power, is dampened by that provider's participation in complementary markets with relatively high Lerner indexes. Third, the digitalization of the network and the provision of complementary services over a common technological platform will give rise to relatively high price–cost margins that naturally serve to constrain the exercise of market power. Finally, these market and technological trends in the telecommunications industry lead to the conclusion that a "little competition" can go a long way in constraining the market power of what by conventional measures would appear to be a dominant firm.

The format for the remainder of this paper is as follows. Section II extends the Landes–Posner model of market power to a multi-market setting. Section III demonstrates the manner in which biases in the measurement of market power are likely to arise when the regulator fails to account for demand interdependence and multi-market participation. Section IV demonstrates the "equivalence" between the multi-market measure of market power and the "critical elasticity" measure. The policy implications of this analysis are discussed in Section V. Section VI provides a summary and conclusion. The appendix formally derives the discrete critical elasticity measure and its relationship with the continuous critical elasticity measure developed in Section IV.

II. FROM SINGLE-MARKET TO MULTI-MARKET MEASURES OF MARKET POWER

In a classic article, Landes and Posner popularize a measure of market power for the dominant firm that depends upon the dominant firm's market share, s,[14] the market price elasticity of demand, $\varepsilon_D > 0$, and the competi-

[14] It should be noted that Landes and Posner support a capacity-based measure of market share rather than the one based on actual output (Landes and Posner, *supra* note 9, at 948–949). The Federal Communications Commission endorsed a capacity-based measure of market share in approving a series of mergers in the wireless industry (Federal Communications Commission, *In the Matter of Applications of AT&T Wireless, Inc. and Cingular Wireless Corporation for Consent to Transfer Control of Licenses and Authorizations*, etc, WT Docket Nos 04-70, 04-254, and 04-323, ¶ 148, *Memorandum Opinion and Order*, October 26, 2004).

tive fringe supply elasticity, $\varepsilon_S > 0$.[15] Specifically,

$$L^S = \frac{P - c_d}{P} = \frac{1}{\varepsilon_d} = \frac{s}{\varepsilon_D + (1-s)\varepsilon_S}, \quad (1)$$

where L^S denotes the Lerner index for the single-market measure of market power,[16] P is price, c_d is the dominant firm's marginal cost, and $\varepsilon_d > 0$ is the price elasticity of demand facing the dominant firm.[17] Equation (1) indicates that the dominant firm's market power is increasing with its market share and decreasing with the market elasticity of demand and the competitive fringe supply elasticity, *ceteris paribus*.

In telecommunications markets today, it is common for firms to operate in multiple markets. In fact, one-stop shopping for telecommunications services in the form of the triple or quadruple play is increasingly common.[18,19] This observation suggests that attempts to measure market power with the use of traditional, single-market metrics is subject to a significant error. We seek to determine the magnitude of this error and its implications for continuing regulatory control when it may be unnecessary or worse.

Suppose that there are $N > 1$ distinct markets, where N is a positive integer. The profits for the multi-market, dominant firm are given by:

$$\Pi_d = [P^i - c_d^i][D^i(\hat{P}) - S^i(\hat{P})] + \sum_{j \neq i}^{N} [P^j - c_d^j][D^j(\hat{P}) - S^j(\hat{P})] - F, \quad (2)$$

where c_d^i is the dominant firm's marginal cost, which is assumed to be constant and separable across markets, F represents the fixed costs of production, D^i is the aggregate demand, $\hat{P} = \langle P^1, \ldots, P^N \rangle$ is a price vector, S^i is the competitive fringe supply, R^i denotes the dominant firm revenues, and ε_d^{ji} is the cross-elasticity of demand for the dominant firm. The superscripts indicate the specific market. Let L^M denote the Lerner index for the multi-market measure of market power.

[15] This approach was pioneered in a seminal article by Saving [Thomas R. Saving, *Concentration Ratios and the Degree of Monopoly Power*, 11 INT'L ECON. REV. 1, 139–146 (1970)].

[16] Lerner observes that "the primary unit to which our measure of monopoly applies is the firm in the very shortest period" [Abba P. Lerner, *The Concept of Monopoly and the Measurement of Monopoly Power*, 1 REV. ECON. STUD. 157, 171 (1934)].

[17] The relationship in (1) holds only when the market operates according to the dominant firm/competitive fringe model and the assumptions of that model hold. It does not hold for other sorts of market equilibria.

[18] This typically entails the joint provision of local telephone service, broadband, video entertainment, and possibly wireless.

[19] Dominant firms typically operate in multiple markets, and demand interdependence is common. *See, e.g.*, Jeremy Bulow, John D. Geanakoplos & Paul D. Klemperer, *Multimarket Oligopoly: Strategic Substitutes and Complements*, 93 J. POL. ECON. 3, 488–511 (1985).

It can be shown that the multi-market measure of market power in market $i \neq j$ is given by:[20]

$$\begin{aligned} L_i^M = \frac{P^i - c_{\mathrm{d}}^i}{P^i} &= \left[\frac{s^i}{\varepsilon_{\mathrm{D}}^i + \varepsilon_{\mathrm{S}}^i(1 - s^i)}\right] \times \left[1 + \sum_{j \neq i}^{N} \frac{(P^j - c_{\mathrm{d}}^j)}{P^j} \frac{R^j}{R^i} \varepsilon_{\mathrm{d}}^{ji}\right] \\ &= \left[\frac{s^i}{\varepsilon_{\mathrm{D}}^i + \varepsilon_{\mathrm{S}}^i(1 - s^i)}\right] \times [1 + k], \end{aligned} \tag{3}$$

where

$$k = \sum_{j \neq i}^{N} \frac{(P^j - c_{\mathrm{d}}^j)}{P^j} \frac{R^j}{R^i} \varepsilon_{\mathrm{d}}^{ji} = \sum_{j \neq i}^{N} L_j^S \frac{R^j}{R^i} \varepsilon_{\mathrm{d}}^{ji}$$

is a correction term to account for multi-market participation and demand interdependence.[21] We can conceive of $k \geq (<)\ 0$ as a measure of net substitutes (complements) across the firm's multi-market participation. Hence, when $k = 0$, there is no demand interdependence or multi-market participation. Under these conditions, the multi-market measure of market power in (3) reduces to the single-market measure of market power in (1).

It is instructive for the discussion in the next section to derive two alternative expressions for (3). To this end, note that the dominant firm's demand is the residual of market demand and the supply of the competitive fringe,

$$Q_{\mathrm{d}}^j = D^j(\hat{P}) - S^j(\hat{P}). \tag{4}$$

Differentiating (4) with respect to P^i, multiplying the resulting expression through by P^i/Q_{d}^j, and simplifying yields

$$\varepsilon_{\mathrm{d}}^{ji} = \left[\frac{\varepsilon_{\mathrm{D}}^{ji} - (1 - s^j)\varepsilon_{\mathrm{S}}^{ji}}{s^j}\right]. \tag{5}$$

[20] For a formal proof of this proposition, *see* Dennis L. Weisman, *Market Power Measurement for Multi-Market Dominant Firms*, 52 ANTITRUST BULL. 2, 169–178 (2007).

[21] It is straightforward to show that the mark-up rule for a multi-product monopolist with interdependent demands is identical to (3) when $s^i = 1$ and notational differences in the cross-elasticities are properly accounted for. *See* JEAN TIROLE, THE THEORY OF INDUSTRIAL ORGANIZATION 70 (Cambridge, MA: MIT Press, 1988). Moreover, in the case of complements, one or more of the goods may be sold below marginal cost, so the Lerner Index may be negative.

Substituting (5) into (3) and simplifying the resulting expression yields our first alternative expression for the multi-market measure of market power:

$$L_i^M = \frac{P^i - c_{\mathrm{d}}^i}{P^i} = \left[\frac{s^i}{\varepsilon_{\mathrm{D}}^i + \varepsilon_{\mathrm{S}}^i(1 - s^i)}\right] \times \left[1 + \sum_{j \neq i}^{N} \frac{(P^j - c_{\mathrm{d}}^j)}{P^j} \frac{R^j}{R^i} \left(\frac{\varepsilon_{\mathrm{D}}^{ji} - \varepsilon_{\mathrm{S}}^{ji}(1 - s^j)}{s^j}\right)\right]. \tag{6}$$

Finally, in the special case of N identical markets,[22] $P^i = P^j$, $c_{\mathrm{d}}^i = c_{\mathrm{d}}^j$, $s^i = s^j$, and $R^i = R^j$.

Also,

$$\sum_{j \neq i}^{N} \frac{(P^j - c_{\mathrm{d}}^j)}{P^j} = (N - 1)\left[\frac{P^i - c_{\mathrm{d}}^i}{P^i}\right].$$

Making these substitutions in (6) and simplifying yields the second alternative expression for the multi-market measure of market power:[23]

$$L_i^M = \frac{P^i - c_{\mathrm{d}}^i}{P^i} = \frac{s^i}{[\varepsilon_{\mathrm{D}}^i + (1 - s^i)\varepsilon_{\mathrm{S}}^i - (N - 1)(\varepsilon_{\mathrm{D}}^{ji} - (1 - s^i)\varepsilon_{\mathrm{S}}^{ji})]}. \tag{7}$$

III. MARKET POWER MEASUREMENT BIAS

In this section, we explore the bias associated with the use of traditional, single-market measures of market power when $k \neq 0$, or when there is demand interdependence and multi-market participation.

Observation 1. Relative to the multi-market measure of market power in (3), the single-market measure of market power in (1) overstates (understates) market power in the case of net complements (substitutes), *ceteris paribus*.[24]

[22] Whereas no two markets are likely identical in all respects, two or more markets may be of approximately equal size and share other common characteristics.

[23] In standard fashion, own price effects are assumed to dominate cross-price effects. This ensures that the denominator on the right-hand side of (7) is strictly positive.

[24] Cameron and Glick produce a similar result in the context of Cournot competition. *See* Duncan Cameron & Mark Glick, *Market Share and Market Power in Merger and Monopolization Cases*, *in* ECONOMIC INPUTS, LEGAL OUTPUTS: THE ROLE OF ECONOMISTS IN MODERN ANTITRUST 121, 125 (Fred S. McChesney, ed., Chichester: Wiley, 1996), pp. 121–129. In particular, they derive a formula that demonstrates how the standard Herfindahl–Hirschman Index overstates market power when firms sell complementary products. *See also* Dennis L. Weisman, *A Generalized Pricing Rule For Multi-Market Cournot Oligopoly*, 81 ECON. LETTERS 95 (2003).

In the case of net complements (substitutes), $k < (>)0$ in (3), the dominant firm's incentive to raise price in market i is diminished (enhanced) because doing so decreases (increases) demand in market j. It follows that the dominant firm's market power is tempered by its participation in complementary markets and augmented by its participation in substitutable markets. To see this relationship directly, recognize that k can be expressed as $k = \sum_{j \neq i}^{N} (P^j - c_d^j)/R^i \, s^j \, D^j \, (\hat{P}) \, \varepsilon_d^{ji}$, which is decreasing (increasing) in s^j for $\varepsilon_d^{ji} < (>)0$ and $P^j > c_d^j$, *ceteris paribus*.

Example 1. Suppose that the regulated firm participates in multiple markets and that the net complements condition prevails. Specifically, it is assumed that $s^i = 0.8$, $\varepsilon_D^i = 2$, $\varepsilon_S^i = 1$, $\varepsilon_S^{ji} = 0$, and $k = -0.3$. For this parameter set, $L_i^S = 0.2857$ and $L_i^M = 0.2$. Hence, failing to account for multi-market participation and demand interdependence leads the policymaker to overstate market power by almost 43 percent.

Observation 2. The market power of the dominant firm in market i is (i) decreasing with the competitive fringe own supply elasticity, ε_S^i, and (ii) decreasing (increasing) with the absolute value of the cross-elasticity of supply for the competitive fringe, $|\varepsilon_S^{ji}|$, when goods i and j are complements (substitutes) in production, *ceteris paribus*.[25]

When goods i and j are complements in production, $\varepsilon_S^{ji} > 0$, an increase in P^i induces the competitive fringe to increase supply in j. This supply increase, in turn, decreases the dominant firm's demand in market j because $Q_d^j = D^j(\hat{P}) - S^j(\hat{P})$. A similar argument explains why the effect is reversed when goods i and j are substitutes in production, $\varepsilon_S^{ji} < 0$.

In evaluating proposed mergers, the Department of Justice considers the likely supply response should the merging firms attempt to raise prices, *post-merger*.[26,27] There are both own and cross-effects to consider. Observe from (6) that market power is decreasing in both the own and cross-competitive fringe supply elasticity when $\varepsilon_S^{ji} > 0$. Hence, when goods i and j are complements in production, the cross-supply elasticity is a compounding influence on the supply response by the competitive fringe in mitigating market power.

Observation 3. Suppose that all elasticity measures are independent of the number of markets, N. The market power for the dominant firm is decreasing (increasing) in N when $\varepsilon_d^{ji} < (>)0$, *ceteris paribus*.

[25] Alternatively, observe from (5) that supply complementarities ($\varepsilon_S^{ji} > 0$) compound the effect of demand complements ($\varepsilon_d^{ji} < 0$) and dampen the effect of demand substitutes ($\varepsilon_d^{ji} > 0$).

[26] *See* U.S. Department of Justice & Federal Trade Commission, *supra* note 3, at § 3. Section 93 of the Competition Act in Canada would also appear to take such supply considerations into account in evaluating factors that may "substantially lessen competition," *post-merger*.

[27] The FCC's decision to deregulate AT&T in the long-distance market was based in part on its finding that the supply elasticity in the industry was sufficiently high that any attempt on the part of AT&T to raise prices unilaterally would invite a competitive supply response of such magnitude as to drive prices back to competitive levels. *See* Federal Communications Commission, *In the Matter of Motion of AT&T Corp. to be Reclassified as a Non-Dominant Carrier*, 11 FCC Rcd. 3271, ¶ 57–58 (1995); Haring & Levitz, *supra* note 5.

This observation follows directly from differentiating (7) with respect to N:

$$\frac{\partial}{\partial N}\{L_i^M\} = \frac{s^i[\varepsilon_{\mathrm{D}}^{\ddot{j}\ddot{i}} - (1-s^i)\varepsilon_{\mathrm{S}}^{\ddot{j}\ddot{i}}]}{\left[\varepsilon_{\mathrm{D}}^{i} + (1-s^i)\varepsilon_{\mathrm{S}}^{i} - (N-1)(\varepsilon_{\mathrm{D}}^{\ddot{j}\ddot{i}} - (1-s^i)\varepsilon_{\mathrm{S}}^{\ddot{j}\ddot{i}})\right]^2} = \frac{(s^i)^2\varepsilon_{\mathrm{d}}^{\ddot{j}\ddot{i}}}{\Omega^2} \quad (8)$$

upon appeal to (5), where $\Omega = [\varepsilon_{\mathrm{D}}^{i} + (1-s^i)\varepsilon_{\mathrm{S}}^{i} - (N-1)(\varepsilon_{\mathrm{D}}^{\ddot{j}\ddot{i}} - (1-s^i)\varepsilon_{\mathrm{S}}^{\ddot{j}\ddot{i}})]$. Hence, the sign of (8) is the same as the $\mathrm{sgn}\{\varepsilon_{\mathrm{d}}^{\ddot{j}\ddot{i}}\}$.

Example 2. The bias in the use of the single-market measure of market power is potentially quite large. Consider the parameter set given by $s^i = 0.5$, $\varepsilon_{\mathrm{D}}^{i} = 2$, $\varepsilon_{\mathrm{S}}^{i} = 1$, $\varepsilon_{\mathrm{D}}^{\ddot{j}\ddot{i}} = -1$, $\varepsilon_{\mathrm{S}}^{\ddot{j}\ddot{i}} = 0$, and $N = 2$. For this set of parameters, $L_i^S = 0.2$ and $L_i^M = 0.143$, indicating that the single-market measure of market power overstates the actual market power by approximately 40 percent. The upward bias doubles to 80 percent when $N = 3$, *ceteris paribus*.

IV. MEASURES OF MARKET POWER AND CRITICAL ELASTICITIES

It is paradoxical perhaps that the technical conditions of supply (scale and scope economies) that constitute the central economic argument for regulation can, under certain conditions, actually be relied upon to constrain the market power of the deregulated firm.[28] To see this scenario, recognize that regulated firms typically operate with high price–cost margins because of pronounced scale and scope economies.[29] Hence, price increases that produce even small reductions in demand can generate large losses in contribution to joint and common costs because the firm's revenues decline much more than the costs it can avoid. It is in this manner that high price–cost margins can serve to discipline the deregulated firm's pricing behavior.[30]

[28] Even when an industry exhibits characteristics of natural monopoly, *intermodal competition* may render regulation unnecessary because such competition from firms using different technological platforms (or entering from different industries, such as cable into telephony) may impose the requisite level of pricing discipline. *See* Ronald R. Braeutigam, *Optimal Policies for Natural Monopolies*, *in* 2 HANDBOOK OF INDUSTRIAL ORGANIZATION 1289 (R. Schmalensee & R.D. Willig eds, Amsterdam: North-Holland, 1989), pp. 1289–1346.

[29] There may be a temptation to conclude that these high price–cost margins are themselves indicative of market power, as they may not be sustainable otherwise. And yet, it would seem difficult to argue that a regulated firm operating with high price–cost margins but nonetheless subject to a *de facto* zero profit constraint, at least in the aggregate across the industry, is exercising market power. A possible exception would be a firm that has market power but dissipates what would otherwise accrue as supranormal profits through rent-seeking and rent-defending behavior. *See* Richard A. Posner, *The Social Costs of Monopoly and Regulation*, 83 J. POL. ECON. 807 (1975).

[30] *See* Jerry A. Hausman & J. Gregory Sidak, *A Consumer-Welfare Approach to Mandatory Unbundling of Telecommunications Networks*, 109 YALE L. J. 477–479 (1999); Jerry A. Hausman, *From 2G to 3G: Wireless Competition for Internet-Related Services*, *in* BROADBAND: SHOULD WE REGULATE HIGH-SPEED INTERNET ACCESS 106 (R.W. Crandall and J.H. Alleman eds, Washington, DC: AEI-Brookings Joint Center for Regulatory Studies, 2002), pp. 106–128; Jerry A. Hausman, *Regulated Costs and Prices in Telecommunications*, *in* 2

The degree to which high price–cost margins constrain market power is indicated by critical fraction or critical elasticity measures. The critical fraction measures the minimum percentage volume loss that would render a contemplated price increase of a given percentage unprofitable. Weisman derives a critical elasticity measure—the elasticity counterpart to the critical fraction—that accounts for multi-market participation and demand interdependence (complements or substitutes).[31] There is an equivalence between (3), which adjusts the Lerner index to account for demand interdependence, and this generalized critical elasticity measure. To see this equivalence, let $\gamma_i = P^i/c^i_{\mathrm{d}}$ define the price–cost ratio for service i.[32] It is immediate that[33]

$$L^S_i = \frac{P^i - c^i_{\mathrm{d}}}{P^i} = 1 - \frac{c^i_{\mathrm{d}}}{P^i} = 1 - \frac{1}{\gamma_i} = \frac{\gamma_i - 1}{\gamma_i}. \tag{9}$$

Substituting (9) into (3) and solving for $\varepsilon^i_{\mathrm{d}} = [\varepsilon^i_{\mathrm{D}} + \varepsilon^i_{\mathrm{S}}(1 - s^i)]/s^i$ yields

$$\varepsilon^{i*}_{\mathrm{d}} = \left[\frac{\gamma^i}{\gamma^i - 1}\right]\left[1 + \sum_{j \neq i}^{N} \frac{(\gamma^j - 1)}{\gamma^j}\frac{R^j}{R^i}\varepsilon^{ji}_{\mathrm{d}}\right] = \left[\frac{\gamma^i}{\gamma^i - 1}\right][1 + k], \tag{10}$$

where $\varepsilon^{i^*}_{\mathrm{d}}$ is the critical elasticity—the minimum value of the own elasticity facing the dominant firm in market i that is just sufficient to discourage the firm from raising price.[34]

INTERNATIONAL HANDBOOK OF TELECOMMUNICATIONS ECONOMICS: EMERGING TELECOMMUNICATIONS NETWORKS 199 (G. Madden ed., Cheltenham, UK: Edward Elgar, 2003), pp. 199–233.

[31] *See* Dennis L. Weisman, *When Can Regulation Defer to Competition for Constraining Market Power?: Complements and Critical Elasticities*, 2 J. COMPETITION L. & ECON. 101 (2006).

[32] Weisman defines γ_i in terms of the net marginal cost, rather than the standard marginal cost. The net marginal cost takes into account the possibility that changes in the output for one product produced by a multiproduct firm could lead to cost changes for other products. *Id.*

[33] The high proportion of sunk costs for the regulated firm suggests that avoidable cost is the relevant measure of marginal cost for this analysis. As Mitchell and Vogelsang observe [BRIDGER MITCHELL & INGO VOGELSANG, TELECOMMUNICATIONS PRICING THEORY AND PRACTICE 9 (1991)]:

> In telecommunications networks, production facilities have well-determined capacities, and the costs of operation are nearly independent of the flow of services through those facilities.... Consequently (except for operator-assisted services) variable costs are very small.

[34] The discrete counterpart to this continuous critical elasticity measure and the corresponding critical fraction are given, respectively, by:

$$\varepsilon^* = \tfrac{1}{[1+I_{\mathrm{p}}-(c/P_0)]} \text{ and } C^* = \tfrac{I_{\mathrm{p}}}{[1+I_{\mathrm{p}}-(c/P_0)]},$$

where ε^* denotes the critical (arc) elasticity, C^* denotes the critical fraction, I_{p} is the

Table 1. Hypothetical ILEC parameter values

Service	$\gamma_{i,j}$	$\varepsilon_{\mathrm{d}}^{ii}$	R^i, R^j	k	ε_{ii}^{*}	$\Delta\varepsilon_{ii}^{*}$
Basic local	2	—	100	—	**2**	—
Long distance	10	−0.30	80	−0.325	1.35	−0.65
Vertical features	20	−0.30	70	−0.300	1.40	−0.60
Broadband	15	−0.25	35	−0.125	1.75	−0.25
Video entertainment	15	−0.20	10	−0.030	1.94	−0.06
Wireless	5	0.20	60	0.145	2.29	0.29
VoIP	5	0.25	10	0.030	2.06	0.06
Total	—	—	—	−0.605	**0.79**	**−1.21**

Consider, for example, an incumbent local exchange carrier (ILEC) that offers the portfolio of services shown in Table 1 with the associated revenues, price−cost ratios, and cross-elasticities as indicated. The column marked with a "k" reflects the correction factor for the critical elasticity in (10) that accounts for demand interdependence and multi-market participation. As the regulator's deregulation or forbearance decision frequently focuses on the market for basic local telephone service, we compute the critical elasticity for this service. The critical elasticity is 2.0 when basic local service is the only service offered in the portfolio. Each service that is added to the portfolio of services changes the critical elasticity by the amount in the last column in the row corresponding to that service.[35] For example, when long distance service is added to the portfolio of services, the critical elasticity decreases to $1.35 = (2.0 - 0.65)$. Summing up the values in the last column indicates the cumulative change in the critical elasticity of -1.21. This figure implies that the critical elasticity for a portfolio

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percentage price increase, c is the marginal cost, and P_0 is the initial price. See the *Appendix* for the derivation and the proof that the discrete critical elasticity measure converges to the continuous elasticity measure in (10) when I_{p} is "small." For example, using the 5 percent hypothetical price increase typically considered by competition authorities when defining product markets, a 6 percent volume loss for a firm whose current price is five times the marginal cost would render an attempted 5 percent price increase unprofitable. In the examples presented in Tables 2 and 3, we use the continuous formulation rather than the discrete approach described here. *See* Weisman, *supra* note 31.

[35] Telecommunications providers are increasingly offering bundled service offerings, sometimes referred to as the triple play or the quadruple play. These bundled offerings can be treated as additional products in the portfolio of services offered by the telecommunications provider. For example, given that these bundled offerings likely substitute for stand-alone basic telephone service, incorporating bundled service offerings into the analysis would have the effect of increasing the value of the critical elasticity, *ceteris paribus*. On the other hand, the presence of bundles offered by *competitors* would increase the own price elasticity for the service in question, i.e., increase the volume that would be lost from a price increase. See Paul R. Zimmerman, *Recent Trends in U.S. Wireline Telecommunications*, 31 TELECOMM. POL'Y 419 (2007), for a comprehensive discussion of recent trends in telecommunications service offerings, including bundling and wireless substitution.

Table 2. Critical elasticities for hypothetical ILEC

Service	Basic local	+Long distance	+Vertical features	+Broadband	+Video entertainment	+Wireless	+VoIP
Basic local	**2**	—	—	—	—	—	—
Long distance	−0.65	**1.35**	—	—	—	—	—
Vertical features	−0.65	−0.60	**0.75**	—	—	—	—
Broadband	−0.65	−0.60	−0.25	**0.50**	—	—	—
Video entertainment	−0.65	−0.60	−0.25	−0.06	**0.44**	—	—
Wireless	−0.65	−0.60	−0.25	−0.06	0.29	**0.73**	—
VoIP	−0.65	−0.60	−0.25	−0.06	0.29	0.06	**0.79**

Table 3. Critical percentage reduction in ILEC demand volumes for $\%\Delta P = 5\%$

Service	Basic local	+Long distance	+Vertical features	+Broadband	+Video entertainment	+Wireless	+VoIP
Basic local	**10**	—	—	—	—	—	—
Long distance	−3.25	**6.75**	—	—	—	—	—
Vertical features	−3.25	−3.00	**3.75**	—	—	—	—
Broadband	−3.25	−3.00	−1.25	**2.50**	—	—	—
Video entertainment	−3.25	−3.00	−1.25	−0.30	**2.20**	—	—
Wireless	−3.25	−3.00	−1.25	−0.30	1.45	**3.65**	—
VoIP	−3.25	−3.00	−1.25	−0.30	1.45	0.30	**3.95**

consisting of all seven services in Table 1 is $0.79 = (2.0-1.21)$, as shown in boldface.

Table 2 indicates how the critical elasticity changes as the ILEC adds services incrementally to its portfolio. The values in boldface along the principal diagonal show the critical elasticity that results from adding the particular service in that row in a cumulative manner to the service(s) in the rows that precede it. For example, the effect of adding broadband to a portfolio consisting of basic local, long distance, and vertical services is to decrement the critical elasticity by 0.25, from 0.75 to 0.50.

Table 3 provides similar information to that in Table 2 except that it is reported in terms of critical reductions in demand volumes. The values in boldface along the principal diagonal are the critical demand reduction values that result from adding the particular service in that row in a cumulative manner to the service(s) in the rows that precede it. Consider, for example, an ILEC with a service portfolio consisting of basic local, long distance, vertical features, and broadband. An ILEC with this service portfolio would not have incentive to raise price by 5 percent provided that the corresponding reduction in demand volumes is at least 2.5 percent.[36] The critical

[36] The 5 percent value is generally considered the benchmark for the "small but significant and nontransitory" increase in price called for in the Department of Justice and the Federal Trade Commission. Department of Justice and Federal Trade Commission, *supra* note 3, at § 1.0.

demand reduction value decreases (increases) with the addition of services that are complements (substitutes) to basic local telephone service in the portfolio offered by the ILEC. These results suggest that the prospect of even relatively small losses in market share can temper market power even when the incumbent provider enjoys high ("dominant") market shares. In other words, a little competition can go a long way.

V. POLICY DISCUSSION

The forgoing sections demonstrate that when (i) firms compete by offering a portfolio of complementary services and (ii) they have relatively high fixed or sunk costs and low marginal costs, then the residual market power of the incumbents may be small, even when market shares are at levels that, by traditional standards, may be suggestive of dominance. In these circumstances, any benefits to retaining price regulation regimes are likely to pale in comparison with the costs imposed by distortions to the competitive process and the costs of regulation itself.

Recent developments in the U.S., Canada, and elsewhere indicate that there has been profound change in the scope of retail price regulation, even to the point of approximating full deregulation in some cases. This change has occurred despite calls from some parties that incumbent market shares are at levels suggestive of continued dominance. The fact that some regulators have seen fit to deregulate even when incumbent market shares are relatively high indicates that they have begun to question the validity of such simple metrics in drawing inferences about market power.

In particular, in the U.S., there has been significant growth in intermodal competition, primarily in the form of mobile wireless and cable telephony, as shown in Figure 1.[37] ILECs have been steadily losing volume since the beginning of the decade, and all providers of wired services (both incumbents and their competitors) have lost volumes in recent years. In contrast, mobile wireless volumes have grown rapidly. For example, in comparison with the beginning of the decade, when wireless volumes were only 42 percent of wireline volumes, by the end of 2007 wireless volumes exceeded wireline volumes by 51 percent. Moreover, as of the end of 2007, 16 percent

[37] Figures 1 and 2 and Table 4 are based on the data from the Federal Communications Commission, which reports the number of end-user lines provided by incumbents and entrants semiannually since the end of 1999. Federal Communications Commission, Industry Analysis and Technology Division, Wireline Competition Bureau, *Local Telephone Competition: Status as of December 31, 2007* (2008). In earlier years, the number of cable telephony lines was quite close to the corresponding number reported by the NCTA. However, because the FCC's data report substantially fewer such lines since the middle of 2005, we have adjusted that data since then to coincide with the figures reported by NCTA. NCTA, *Cable Voice/Phone Customers 2001–2007*, *available at* http://www.ncta.com/Statistic/Statistic/ResidentialTelephonyCustomers.aspx.

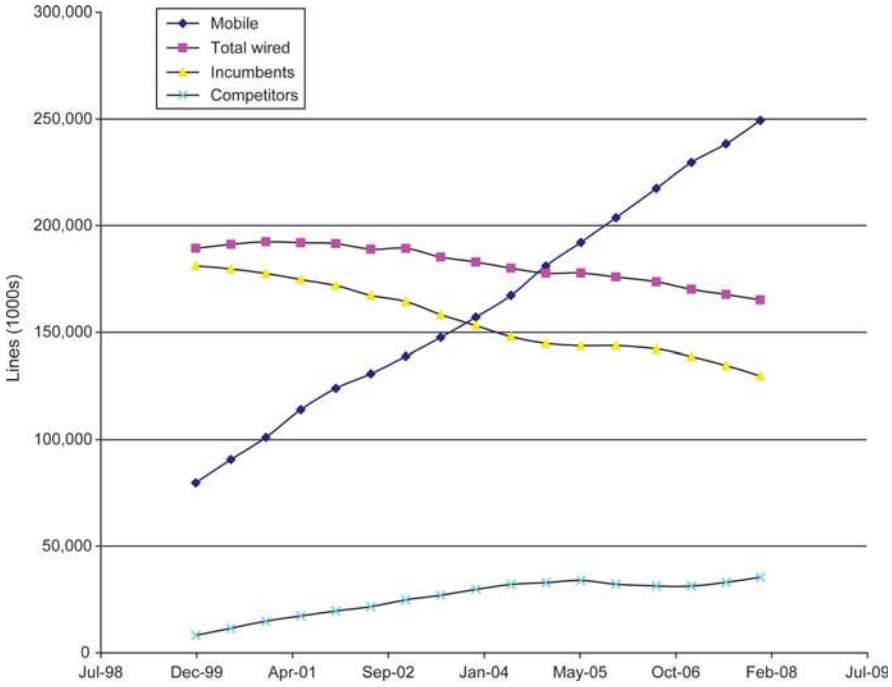

Figure 1. Trend in the U.S. mobile and wireline volumes.

of U.S. households had "cut the cord" and no longer maintain wired service.[38]

Figure 2[39] illustrates how the shares of entry modes—full facilities-based, switch-based,[40] and resale of incumbents' facilities—have shifted over time. These shifts in the competitive landscape reflect, in part, a more conservative approach by the FCC concerning mandatory sharing of network elements at regulated prices.[41] Up until 2003, the growth in competitors' lines was dominated by providers who relied exclusively on wholesale inputs

[38] Blumberg and Luke report that an additional 13.1 percent of households are "wireless mostly," that is, although they have both wireless and wireline phones, they receive almost all calls on wireless phones. Stephen J. Blumberg & Julian V. Luke, *Early Release of Estimates from the National Health Interview Survey, July–December 2007* (Division of Health Interview Statistics, National Center for Health Statistics, 2008).

[39] The reduction in competitors' lines after 2005 is explained in large part by the fact that the acquisitions of AT&T by SBC and MCI by Verizon resulted in lines that were formerly classified as competitors' lines being reclassified as incumbent lines after the mergers were approved.

[40] In Figure 2, a switch-based provider owns its own switches, but obtains loop facilities—unbundled network element loops (UNE-L) (the wires and supporting structures between its switch and the customers)—as wholesale inputs from the incumbent.

[41] Tardiff and Robinson & Weisman provide additional details on these developments (Tardiff, *supra* note 1; Robinson & Weisman, *supra* note 8).

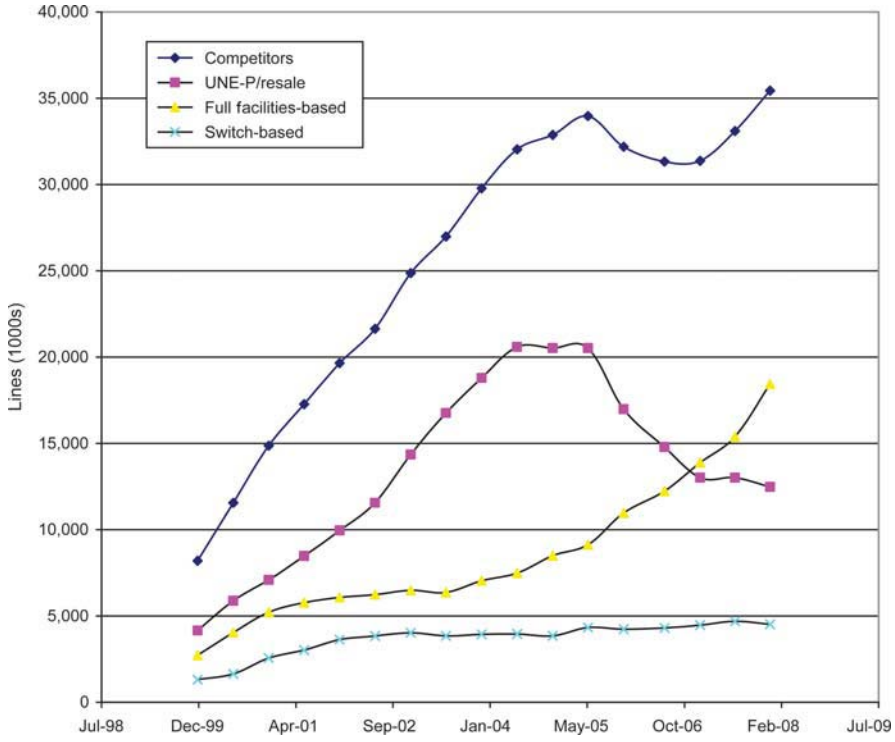

Figure 2. Trend in competitors' entry modes in the U.S.

[unbundled network element platform (UNE-P) or resold lines] rather than deploying their own network facilities. The change in policy to less accommodative entry coincided with a diminution in the exclusive use of wholesale network inputs and a rapid increase in the number of competitive lines that wholly or partially use competitor-owned facilities.

Table 4 compares the volumes represented in Figure 2 for two reporting periods: June 2003—immediately before the release of the FCC's Triennial Review Order,[42] which signaled the beginning of the end of the mandatory availability of the unbundled element platform at regulated prices—and December 2007, the most recent period. Total wired competitor lines grew by 31 percent, whereas the growth rates for full facilities-based (particularly intermodal lines) were substantially higher—indeed, the number of

[42] Federal Communications Commission *Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, CC Docket No. 01–338; *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96–98; *Deployment of Wireline Services Offering Advanced Telecommunications* Capability, CC Docket No. 98–147, Report and Order on Remand and Further Notice of Proposed Rulemaking, August 21, 2003.

Table 4. Change in pattern of competitive entry: 2003–2007

	June 2003	December 2007	%Change
Intermodal	3,123	15,100	383.5
Intramodal facilities-based	3,247	3,339	2.8
UNE-L	3,851	4,519	17.3
UNE-P	11,877	6,063	−49.0
Resale	4,887	6,411	31.2
UNE-P/resale	16,764	12,474	−25.6
Other	10,221	22,958	124.6
Total	26,985	35,432	31.3
%UNE-P/resale	62.1	35.2	

intermodal (that is, cable telephone) lines almost quadrupled over the period. UNE-L grew by about 17 percent, whereas UNE-P lines fell by 49 percent. Overall, lines that required some use of competitor-owned facilities [intramodal facilities-based, intermodal, and UNE-L (with competitor-owned switching)] more than doubled, whereas the modes of entry that require no CLEC network facilities (UNE-P plus resale) fell by about 26 percent. As a result, whereas in 2003, the use of wholesale inputs only accounted for slightly over 60 percent of competitors' lines, the mix of entry modes has shifted so that four and one-half years later 65 percent of lines are now supplied either fully or partially with network facilities owned by competitors.

Local exchange competition in Canada has accelerated in recent years, primarily because of the inroads by cable telephony providers of residential services. As shown in Figure 3,[43] although total wired lines have been relatively flat since 2001, the number of lines served by competitors has grown substantially—the competitors' share almost quadrupled between 2003 and 2007 from 5 percent to almost 19 percent.

In North America, there has been a trend towards relaxed regulation or deregulation of retail prices in a manner that suggests regulators are discounting the significance of single-market share metrics to infer market power. For example, as of October 2006, the regulatory authorities or legislative processes in at least 31 of the 50 U.S. states had relaxed regulation (or completely deregulated) the retail services of ILECs.[44] In California, the regulatory authority explicitly concluded that the larger ILECs no longer have market power sufficient to justify price regulation and as a result

[43] Figure 3 is based on data reported in CRTC. Canadian Radio-television and Telecommunications Commission, *CRTC Telecommunications Monitoring Report* (2006); Canadian Radio-television and Telecommunications Commission, *CRTC Telecommunications Monitoring Report* (2007); Canadian Radio-television and Telecommunications Commission (2008), *supra* note 10.

[44] *See* Tardiff, *supra* note 1.

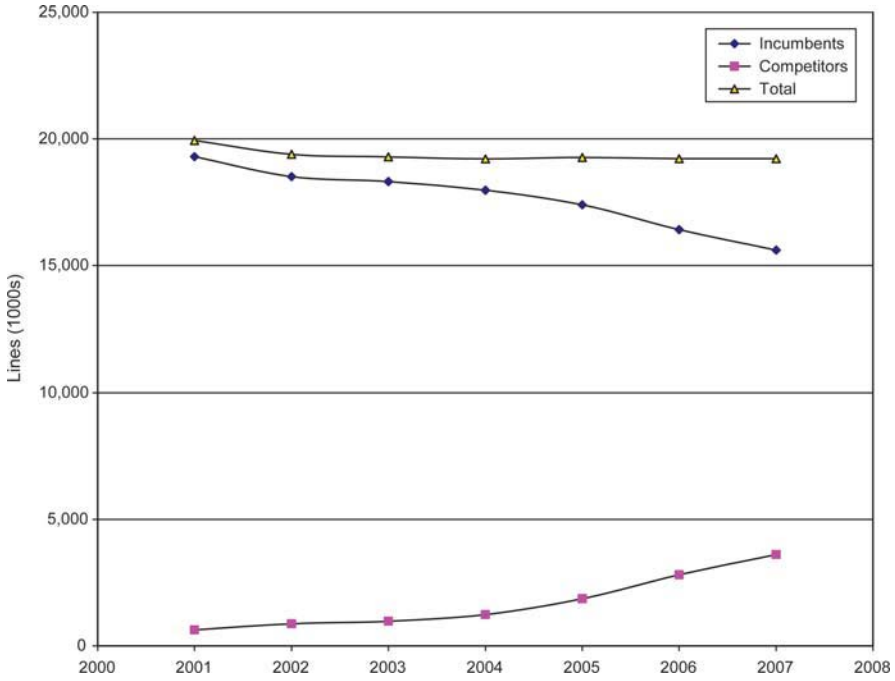

Figure 3. Trend in Canadian wireline volumes.

effectively deregulated all services except for the basic residential service. This decision was based on a myriad of competitive alternatives available to consumers, including wireless, cable telephony, and other facilities-based carriers in addition to the continued availability of wholesale inputs under the 1996 Telecom Act.[45]

The path to more streamlined regulation or forbearance in Canada is perhaps even more closely aligned with the formal analysis presented here and the fact that competitive inroads have materialized at a relatively rapid pace.[46] Although one of the parties to the forbearance proceeding proposed an approach that (i) was similar to the deregulatory framework that was ultimately adopted; and (ii) is broadly consistent with our

[45] Because of the need to address low income and high-cost funding issues, residential rates were frozen through January 1, 2009. California Public Utilities Commission, Decision 06-08-030, August 30, 2006, available at http://cpuc.ca.gov/word_pdf/final_decision/59388.pdf. After this date, incumbent providers are allowed to (but not required to) increase monthly basic residential flat rates by $3.25 at the beginning of 2009 and 2010. Beginning in 2011, there will be no cap on residential rates, except in those areas receiving high-cost support. California Public Utilities Commission, Decision 08-09-042, September 18, 2008, available at http://docs.cpuc.ca.gov/word_pdf/final_decision/91318.pdf.

[46] Brennan provides a comprehensive account of these developments. *See* Timothy J. Brennan, *Skating Toward Deregulation: Canadian Developments*, 60 FED. COMM. L. J. 325 (2008).

conclusion that competitive inroads into telecommunications quickly erode market power, the Canadian regulator initially adopted a market share test for determining whether there was sufficient competition in a particular geographic area to warrant deregulation. Specifically, the Canadian Radio-television and Telecommunications Commission established a process for determining when it would forbear from regulating certain aspects of basic exchange services.[47] Those determinations would be made with respect to geographic markets that, for the most part, are defined as the "census metropolitan areas." The relevant product market includes VoIP (both facilities-based and services provided by third parties, such as Vonage, over broadband facilities), but not wireless. The process initially called for forbearance to be granted when (i) incumbents had experienced a 25 percent market share loss, (ii) they had demonstrated that rivalrous behavior exists in the market, and (iii) they had satisfied other conditions related to the quality of service and the provision of wholesale services to competitors. Finally, despite the fact that the rationale for forbearance is that competition is sufficient to ensure "just and reasonable" prices, the CRTC's decision nonetheless imposes a price ceiling on stand-alone residential service.

The Canadian ILECs requested reconsideration of the CRTC's decision, and, in response, the Minister of Industry proposed and the Governor in Council ordered a new forbearance framework be used.[48] This new framework (i) replaced the CRTC's market share criterion with a test in which the presence of two additional facilities-based offering services throughout the market would be the basis for forbearance;[49] (ii) reduced the size of geographic markets to local exchanges; and (iii) limited somewhat the quality-of-service standards.[50] In the case of residential services, the competitive presence criterion allows one of the two additional competitors to be an unaffiliated wireless provider, which effectively negates the CRTC's determination that wireless and traditional telephone services are not in the same product market.

[47] Canadian Radio-television and Telecommunications Commission, *Forbearance from the Regulation of Retail Local Exchange Services*, Telecom Decision CRTC 2006-15, April 6, 2006.

[48] Industry Canada, *Order Varying Telecom Decision CRTC 2006-15*, 141(8) CAN. GAZETTE (2007), *available at* http://canadagazette.gc.ca/partII/2007/20070418/html/sor71-e.html.

[49] In particular, a facilities-based provider that satisfies this criterion is one which is capable of serving at least 75 percent of the local exchange lines in the geographic area at issue with either its own facilities or a combination of its own facilities and services leased from other providers.

[50] The CRTC's decision would have required the applicant to meet 14 specific standards averaged over the sixth months preceding the application. The Governor in Council eliminated five of the 14 standards and increased the window for the six month period from eight months before the application to any time before the CRTC renders a decision on the application.

Although the forbearance determination is made on an exchange-by-exchange basis, a substantial proportion of incumbents' lines have already been forborne. TELUS, for example, applied for and was granted forbearance in geographic areas that account for approximately three-quarters of its residential lines and two-thirds of its business lines.[51] As of June 30, 2008, throughout Canada, the CRTC has forborne from regulating in exchanges that account for 73 percent of residential lines and 65 percent of business lines.[52]

VI. CONCLUSION

Regulators commonly view a dominant provider as a firm with the ability to leverage significant market power. The market share of the provider in the particular market is frequently used by regulators to draw inferences about dominance. In telecommunications markets, in particular, where demand complementarities, multi-market participation, and high price/cost margins are the norm, traditional, single-market measures of market power are likely to seriously overstate extant market power. These single-market measures lead to a paradox in which a multi-market provider that is seemingly dominant in each market if considered in isolation may not be able to leverage that "dominance" to exercise significant market power in any market. Under these conditions, the erosion of market power can occur long before incumbents have lost significant amounts of market share. Consequently, any credible assessment of market power must recognize that a little competition can go a long way.

From the perspective of public policy, such biases in the measurement of market power have potentially serious consequences. To wit, antitrust authorities may be disinclined to approve mergers, and regulators may be reluctant to deregulate or forbear if they rely upon metrics that overstate market power. In other words, policymakers must begin to recognize the degree to which demand interdependence and multi-market participation can serve to place natural limits on the exercise of significant market power. The recent deregulatory trends in retail telecommunications markets in the U.S. and Canada in the face of relatively high incumbent market shares may signify that this process has already begun.

APPENDIX

Define the initial profits for the firm by

$$\pi_0 = Q_0[P_0 - c], \tag{A1}$$

[51] TELUS, 2007 Financial Review 56 (2007), *available at* http://about.telus.com/investors/annualreport2007/_files/pdf/en/reportbuilder-full.pdf.

[52] Canadian Radio-television and Telecommunications Commission (2008), *supra* note 10.

where Q_0 is the initial quantity, P_0 is the initial price, and c is the constant marginal cost. The objective is to find the critical fraction of demand reduction, C^*, following a contemplated percentage price increase of I_p that would generate the same level of profit. This implies that

$$\pi_0 = Q_0[P_0 - c] = Q_1[(1 + I_p)P_0 - c] = \pi_1, \tag{A2}$$

where Q_1 is the new quantity following the price increase, and π_1 is the new level of profit. Solving (A2) for the demand ratio, Q_1/Q_0, yields

$$\frac{Q_1}{Q_0} = \frac{[P_0 - c]}{[(1 + I_p)P_0 - c]}. \tag{A3}$$

Subtracting 1 from both sides of (A3) and simplifying yields

$$\frac{Q_1}{Q_0} - 1 = \frac{Q_1 - Q_0}{Q_0} = \frac{-I_p}{[1 + I_p - c/P_0]}. \tag{A4}$$

Taking the absolute value of both sides of (A4) yields

$$C^* = \frac{I_p}{[1 + I_p - (c/P_0)]}. \tag{A5}$$

Divide both sides of (A5) by I_p to obtain

$$\frac{C^*}{I_p} = \frac{1}{[1 + I_p - (c/P_0)]}. \tag{A6}$$

Take the limit of (A6) as $I_p \to 0$, which corresponds to an infinitesimally small price change, to obtain

$$\lim_{I_p \to 0}\left(\frac{C^*}{I_p}\right) = \frac{1}{[1 - (c/P_0)]}, \text{ or} \tag{A7}$$

$$\varepsilon^* = \frac{1}{[1 - (c/P_0)]} = \frac{1}{1 - (1/\gamma)} = \frac{\gamma}{\gamma - 1}. \tag{A8}$$

The term on the far right-hand side of (A8) is the expression for the continuous critical elasticity measure in (10) when the firm operates in a single market, or when $k = 0$.